REMARKS

This is in response to the Office Action that was mailed on May 7, 2004. Claim 1 is amended based upon such disclosure as that from the 15th line on page 8 through the 20th line on page 10 of the specification ("A first bottom liquid A3 … is recovered from the bottom of the first distillation column…. The first bottom liquid A3 is introduced into a third distillation column to thereby yield ε-caprolactone"). No new matter has been introduced. Claims 1-11 are in the application.

Claim 1 was rejected under the second paragraph of 35 U.S.C. §112 as failing to define the invention properly, on the ground that the claim failed to recite a step for making ε-caprolactone. This ground of rejection is believed to be obviated by the present amendment of claim 1.

Claims 1-11 were rejected under 35 U.S.C. §103(a) as being unpatentable over JP 2002-179667 (Takashi) in view of *Chemical Engineer's Handbook* (Perry). The rejection is respectfully traversed.

In the process for producing ε-caprolactone of Takashi, the distillate recovered from the first distillation column comprises

cyclohexanone in a low concentration. Accordingly, the second distillation column for recovering cyclohexanone must treat a large amount of distillate. The size and treatment capability of the second distillation column therefore must be large, requiring increased energy for operation. Thus the Takashi process is economically unadvantageous. See lines 4-17 on page 10 of the present specification. The present invention provides a process that solves this problem. In accordance with the present invention, unreacted cyclohexanone is efficiently separated and purified in a second distillation column by removing a side-cut fraction containing unreacted cyclohexanone in a high concentration from a first distillation column and recycling the unreacted cyclohexanone to produce ε-caprolactone in high yield.

Takashi relates to a process for producing ε-caprolactone that involves distilling the target compound from a crude reaction mixture obtained by oxidizing cyclohexanone. The crude reaction mixture which is distilled in the process of Takashi comprises unreacted raw material cyclohexanone and the target ε-caprolactone. The crude reaction mixture also comprises unreacted oxidizing agent, solvent for the oxidizing agent, acid derived from the oxidizing agent, by-products derived from cyclohexanone (e.g., adipic acid), and a polymerized product of ε-caprolactone. See page 1, line 17 to page 2, line 2 of the present specification.

Perry, on the other hand, simply describes a step of petroleum distillation. Thus, Perry and Takashi differ significantly as to the materials which they distill, with Perry being concerned with petroleum and Takashi being concerned with a crude reaction mixture containing the above-mentioned components. One of ordinary skill in the art would not be motivated to apply the petroleum distillation step of Perry to the complex production process of Takashi.

Additionally, it is noted that the invention of claim 2 comprises at least eight steps: (i) feeding a reaction mixture; (ii) distilling a first distillate; (iii) recovering a first fraction; (iv) recovering a first bottom liquid; (v) introducing the first fraction to a second distillation column; (vi) recovering a second bottom liquid; (vii) recycling the second bottom liquid; and (viii) introducing the first bottom liquid into a third distillation column. With respect to this eight-step process, the Examiner has not affirmatively demonstrated that Takashi "discloses the identical distillation process for purifying epsilon-caprolactone prepared by the oxidation of cyclohexanone except that the removal of cyclohexanone from other lower boiling constituents of the first distillate which is lower boiling than the caprolactone is done in a second distillation".

In any event, the Perry reference has not been shown furnish even the aspect of the present invention which the Examiner has

acknowledged to be missing from the Takashi disclosure. The Examiner indicates that "Perry discloses at p. 13-38 that in petroleum distillation a number of side-stream products are withdrawn as well as overhead and bottoms". Firstly, the present invention is concerned with the production of ε-caprolactone, not with petroleum distillation. Secondly, the Examiner has failed to identify where, in the 25 pages of Perry that he cites, one of ordinary skill in the art will find the allegedly relevant material. Thirdly, the Examiner has failed to establish how a person of ordinary skill in the art would be motivated to take a specific step from Perry and add it to or substitute it for a specific step in the Takashi process.

It is respectfully submitted that the Examiner has failed to establish a *prima facie* case of obviousness based on the Takashi and Perry references.

If the Examiner should eventually establish a *prima facie* case of obviousness in the present application, the Examiner's attention will then be directed to the comparative showing in the specification. Applicants clearly demonstrate in the specification the unexpected superiority of the present invention, represented by Example 1, as compared to conventional processing, represented by Reference Example 1. Tables 2-1, 2-2, and 2-3, on pages 21-23 of the specification, show results obtained with conventional processing. Tables 1-1, 1-2, and 1-3, on pages 18-20 of the

specification, show the significantly improved results obtained in accordance with the present invention.

Clearly, the rejection of record is not sustainable, and should be withdrawn.

If the Examiner has any questions concerning this application, he is invited to contact Richard Gallagher (Registration No. 28, 781) at (703) 205-8008.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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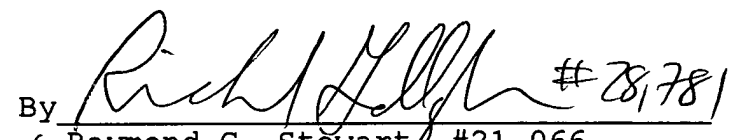
By  #28,781
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